Space Weather Forecast

Issued on Tuesday, 21 December 2021 at 00:57 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

---

Space Weather Forecast Headline: Chance of Minor Geomagnetic Storms day 2 (21st). Chance of Moderate flares throughout. A possible Earth-directed coronal mass ejection (CME) later in the period - pending analysis.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar Activity has been Moderate over the past 24 hours, with a number of common class X-ray flares observed and one moderate flare at 20/1136 UTC. This has produced a coronal mass ejection (CME), which given its location near southern centre disc, gives the possibility an Earth-directed CME, pending further analysis. There are currently eight sunspot regions on the Earth facing disc. The most complex of these are a series of three regions in the southern central disc, which have been the main source for solar activity during the past 24 hours. All other regions are either small unipolar or bipolar regions, with limited flare risk, but with the potential for further development. No other CMEs were observed in available imagery.

Solar Wind / Geomagnetic Activity: Solar winds started the period at background levels, rising to elevated and strong levels, with a peak of 638km/s at 20/2225 UTC as a result of a high speed stream from a coronal hole. The Interplanetary Magnetic Field Strength (IMF), Bt started the period at moderate levels, falling to moderate and weak. The all important north-south component started the period strong, since has become moderate to weak. These parameters are likely the result of Earth connecting to coronal hole 36 and lead to Quiet to Active (Kp 2-4) geomagnetic activity.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) remained at background with no solar radiation storms occurring.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be mostly Low, with a chance (40%) of isolated Moderate flares, predominately from the more complex sunspot regions on the disc, but cannot be ruled out from the other sunspot regions on the disc given the possibility of further development.

Solar Wind / Geomagnetic Activity: A coronal mass ejection (CME) was seen leaving the sun on the 20th as a result of the Moderate-class flare from the complex sunspot region in the southern centre disc. Given its location on the disc, this does have the potential to be Earth-directed, pending analysis. No other CMEs were observed in available imagery. Elevated solar winds are expected to persist through days 1-2 (21st and 22nd) due to coronal hole enhancements, before gradually easing on Day 3 (23rd). Geomagnetic activity is forecast to be Quiet to Unsettled through days 1-2 (21st and 22nd), with Active intervals possible. These are most likely to occur early on day 1 (21st), when there is a chance of a Minor Geomagnetic Storm. On days 3 (23rd and 24th), geomagnetic activity is likely to become mostly Quiet

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2021. All Rights Reserved.

Met Office Space Weather Forecast

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is forecast to stay at background with no solar radiation storms expected. Any significant flares could lead to this count rate increasing, but are still expected to stay below radiation storm level.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	30	10	30	30
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	40	40	40	40
Very Active	R3 to R5 X	No	2	2	2	2

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	5	5	5	5
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2021. All Rights Reserved.